78. (New) An apparatus according to claim 76, wherein the position controller is constructed and arranged to control in two steps the adjustment of the position of the physical reference surface to the preferred value, said two steps including a first step consisting of an initial coarse adjustment of the position of the physical reference surface based upon an output of the position measuring system, and a second step consisting of a fine adjustment of the physical reference surface based upon an output of the at least one sensor.

79. (New) An apparatus according to claim 1, wherein the at least one sensor has a measurement range over which an output of said at least one sensor is linearly related to the position in the first direction, or over which the output of said at least one sensor is linearized to the position in the first direction.

80. (New) An apparatus according to claim 79, wherein the at least one sensor is constructed and arranged to provide feedback to the position controller, and

the position controller is constructed and arranged to receive said feedback and based upon the feedback, the position of the second object table in the first direction is adjusted such that the surface of the substrate remains in the linear or linearized range of the at least one sensor during height mapping.

81. (New) An apparatus according to claim 80, wherein the position controller is constructed and arranged to adjust the position of the second object table in the first direction according to a global wedge of the substrate.

82. (New) An apparatus according to claim 79, further comprising a device configured to retain a correction table or formula which is used to linearize the output of the at least one sensor.

83. (New) An apparatus according to claim 30, wherein the apparatus is constructed and arranged to calculate the position setpoints for the position controller before the second object table is moved to the exposure station.

84. (New) An apparatus according to claim 1, wherein the second object table is constructed and arranged to fixedly hold the substrate using vacuum suction, and to release

and reapply the vacuum suction prior to height mapping to allow relaxing thermal stresses in the substrate.

85. (New) An apparatus according to claim 3, wherein the level sensor is constructed and arranged to adjust the linear array of points to match a width of a target portion on the surface of the substrate.

86. (New) An apparatus according to claim 3, wherein the level sensor is constructed and arranged such that a central point of the linear array of points passes along a midline of the target portion during height mapping.

87. (New) An Apparatus according to claim 3, wherein the level sensor is constructed and arranged such that data obtained from points of the linear array which do not lie wholly within the target portion are ignored.

88. (New) An apparatus according to claim 3, wherein the level sensor is constructed and arranged to measure a position in said first direction of an additional point which is spaced apart from the linear array of points, the additional point being measurable over a wider range of positions in the first direction than the linear array of points, and

the level sensor is constructed and arranged such that during height mapping the additional point precedes the linear array of points.

89. (New) An apparatus according to claim 88, wherein the level sensor comprises a dedicated detector configured to measure the position in the first direction of the additional point, the dedicated detector comprising an array of detection regions which lie in either side of a line corresponding to a desired value of the measured position in the first direction, the array being symmetric about a line which bisects a central detection region of the array.

90. (New) An apparatus according to claim 89, wherein the linear array of points and the additional point are illuminated for measurement using a single optical source, the projection grating and the projection optics.

91. (New) An apparatus according to claim 5, wherein the linear array of points and the

additional point are illuminated for measurement using a single optical source, the projection grating and the projection optics.

92. (New) An apparatus according to claim 5, wherein said projection grating is positioned with a rotation around its optical axis such that said image of said projection grating is not parallel to any substrate co-ordinate axis.

93. (New) An apparatus according to claim 5, wherein said projection optics is constructed and arranged to project illumination forming the image, at an angle of between 60 degrees and 80 degrees relative to a normal to the surface of said substrate.

94. (New) An apparatus according to claim 7, wherein the apparatus further comprises a synchronization bus configured and arranged to use clock signals to synchronize said substantially simultaneous measurement by said first and second sensors.

95. (New) An apparatus according to claim 10, wherein the apparatus further comprises an additional sensor at the exposure station, the sensor being constructed and arranged to provide an initial determination of the position in said first direction at which said physical reference surface corresponds to the focal plane of said projection system.

96. (New) An apparatus according to claim 11, wherein the additional sensor comprises at least two detectors and a beamsplitter constructed and arranged such that a zero measurement is obtained when a beam incident on the beamsplitter is split equally into two beams by the beamsplitter to the at least two detectors, the beamsplitter being constructed and arranged such that the two beams upon exiting the beamsplitter have substantially the same cross-sectional shape and have traveled substantially the same path length.

97. (New) An apparatus according to claim 34, wherein the position of the physical reference surface in the first direction is adjusted to a preferred value prior to height mapping, and said preferred value is set as a zero measurement in the first direction of the at least one sensor and as a zero measurement in the first direction of the position measuring system.

98. (New) An apparatus according to claim 97, wherein the preferred value is at or

adjacent to a centre point of a range of measurements in the first direction for which the at least one sensor provides a substantially linear output.

99. (New) An apparatus according to claim 97, wherein the position controller is constructed and arranged to control in two steps the adjustment of the position of the physical reference surface to the preferred value, said two steps including a first step consisting of an initial coarse adjustment of the position of the physical reference surface based upon an output of the position measuring system, and a second step consisting of a fine adjustment of the physical reference surface based upon an output of the at least one sensor.

100. (New) An apparatus according to claim 34, wherein the at least one sensor has a measurement range over which an output of said at least one sensor is linearly related to the position in the first direction, or over which the output of said at least one sensor is linearized to the position in the first direction.

101. (New) An apparatus according to claim 100, wherein the at least one sensor is constructed and arranged to provide feedback to the position controller, and

the position controller is constructed and arranged to receive said feedback and based upon the feedback, the position of the second object table in the first direction is adjusted such that the surface of the substrate remains in the linear or linearized range of the at least one sensor during height mapping.

102. (New) An apparatus according to claim 100, wherein the position controller is constructed and arranged to adjust the position of the second object table in the first direction according to a global wedge of the substrate.

103. (New) An apparatus according to claim 100, further comprising a device configured to retain a correction table or formula which is used to linearize the output of the at least one sensor.

104. (New) An apparatus according to claim 34, wherein said at least one sensor comprises a level sensor constructed and arranged to simultaneously measure positions in said first direction of a linear array of points on said substrate.

105. (New) An apparatus according to claim 104, wherein the level sensor is constructed and arranged to adjust the linear array of points to match a width of a target portion on the surface of the substrate.

106. (New) An apparatus according to claim 104, wherein the level sensor is constructed and arranged such that a central point of the linear array of points passes along a midline of the target portion during height mapping.

107. (New) An Apparatus according to claim 104, wherein the level sensor is constructed and arranged such that data obtained from points of the linear array which do not lie wholly within the target portion are ignored.

108. (New) An apparatus according to claim 104, wherein the level sensor is constructed and arranged to measure a position in said first direction of an additional point which is spaced apart from the linear array of points, the additional point being measurable over a wider range of positions in the first direction than the linear array of points, and

the level sensor is constructed and arranged such that during height mapping the additional point precedes the linear array of points.

109. (New) An apparatus according to claim 108, wherein the level sensor comprises a dedicated detector configured to measure the position in the first direction of the additional point, the dedicated detector comprising an array of detection regions which lie in either side of a line corresponding to a desired value of the measured position in the first direction, the array being symmetric about a line which bisects a central detection region of the array.